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The DYNA PAC CC 20 is primarily intended for working on asphalt, but is also suitable for the compaction of base courses and other types of filler. Wide drums and a high working speed give the roller outstanding compaction capacity, making it particularly suitable for major projects such as streets, highways, car parks and industrial yards. Due to its excellent manoeuvrability, it can also be used to advantage for minor work where space is limited, such as on pavements and cycle tracks. The DYNA PAC CC 20 features two vibrating amplitudes which, together with adjustable frequency, enables the roller to be used for most types of work. The working speed of the roller is infinitely variable, both forward and reverse, throughout the speed range.

**APPLICATIONS**

1. Asphalt surfacing
   Toppings or wearing courses are normally compacted to the specified density in 2-4 vibrating passes (see Table). In the majority of cases, rolling may be commenced directly with vibrations. On extremely hot asphalt or if more suitable for other reasons, rolling may be begun with one or two static passes. A common practice is to complete one pass up to the spreader without vibrations and subsequently return using vibrations.

   Another alternative is to begin with vibrations on the rear drum only and subsequently continue with vibrations on both drums.

   A suitable working speed when vibrating asphalt surfaces with the CC 20 is normally 5-7 km/h.

   Rolling is normally concluded with two static passes to even the surface. During these passes, the roller may be driven at high speed - up to the maximum.

2. Cement-stabilized sand and gravel base courses
   When compacting stabilized base courses, adjustable amplitude often confers distinct advantages.

3. Gravel or macadam base courses
   Base courses of gravel or macadam are normally compacted in up to 15 cm layers in 4-6 passes to 95-100% mod. Proctor.

4. Bitumen-stabilized gravel base courses (BG)
   The number of passes suitable for different layer thickness will be evident from the table. Rolling is normally commenced with vibrations.

<table>
<thead>
<tr>
<th>Thickness cm</th>
<th>Number of vibrating passes</th>
<th>Amplitude setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>2 - 4</td>
<td>L</td>
</tr>
<tr>
<td>3.5</td>
<td>2 - 4</td>
<td>L/H</td>
</tr>
<tr>
<td>5</td>
<td>2 - 4</td>
<td>L/H</td>
</tr>
<tr>
<td>7.5</td>
<td>3 - 5</td>
<td>H</td>
</tr>
<tr>
<td>10</td>
<td>3 - 5</td>
<td>H</td>
</tr>
<tr>
<td>15</td>
<td>3 - 5</td>
<td>H</td>
</tr>
<tr>
<td>20</td>
<td>4 - 6</td>
<td>H</td>
</tr>
</tbody>
</table>

5. Sub-bases
   Sub-bases are normally compacted in up to 30 cm layers in six passes to 90-95% mod. Proctor.

6. Embankment fill
   Gravel and sand are compacted in up to 30-50 cm layers. Fine-particle, cohesive materials can be compacted in 15-30 cm layers.
CENTRIFUGAL FORCE AT DIFFERENT AMPLITUDES AND FREQUENCIES

Vibrational force can easily be varied from the driver's platform by setting the amplitude to low or high. The frequency can also be varied from a normal value of 3000 vpm down to 2450 vpm. The centrifugal forces at different amplitude settings and different frequencies are given in the table.

<table>
<thead>
<tr>
<th>Engine speed rev/min</th>
<th>Frequency vpm</th>
<th>Centrifugal force, kgf</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low amplitude = 0.45 mm</td>
<td>High amplitude = 0.6 mm</td>
</tr>
<tr>
<td>2200</td>
<td>3000</td>
<td>3750</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5000</td>
</tr>
<tr>
<td>2000</td>
<td>2700</td>
<td>3100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4100</td>
</tr>
<tr>
<td>1800</td>
<td>2450</td>
<td>2500</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3350</td>
</tr>
</tbody>
</table>

AMPLITUDES FOR DIFFERENT KINDS OF WORK

L = Low amplitude (0.45 mm)
H = High amplitude (0.6 mm)

<table>
<thead>
<tr>
<th>Work</th>
<th>Amplitude setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphal ted concrete (top and binding layers)</td>
<td>L/H</td>
</tr>
<tr>
<td>Bitumen-stabilized gravel (BG)</td>
<td>H</td>
</tr>
<tr>
<td>Base courses of gravel or macadam</td>
<td>H</td>
</tr>
<tr>
<td>Sub-bases, embankment fill</td>
<td>H</td>
</tr>
</tbody>
</table>

AMPLITUDE SETTINGS, Fig. 2

The amplitude is controlled from the driver's platform by the controls used to engage the vibrations. Two levers, one for each drum, are located on the right-hand side of the instrument panel.

Vibrations are disengaged when levers A and B are in the central positions. Move the levers forward to engage high amplitude and rearward to engage low amplitude.

Inadvertent engagement between the different amplitude settings is prevented by the round slotted discs C which are set for high or low amplitude by rotating them through 180° when the controls are in the central position (neutral).

Note: The vibrating shaft should have come to rest before a different amplitude setting is engaged.

Fig. 2 Vibration control

A. Front drum - blue knob
B. Rear drum - black knob
C. Amplitude setting discs

PRACTICAL CAPACITY

PRACTICAL CAPACITY FOR SOIL COMPACTION

Practical capacity = 0.75 x theoretical capacity. The reduction factor of 0.75 assumes 10% overlap and an effective operating time of 50 min/hour. Working speed 5 km/h (80 m/minute).

Normal values

<table>
<thead>
<tr>
<th>Number of vibrating passes</th>
<th>Practical surface cap. m²/h</th>
<th>Layer thickness after compaction cm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>2600</td>
<td>260</td>
</tr>
<tr>
<td>4</td>
<td>1300</td>
<td>130</td>
</tr>
<tr>
<td>6</td>
<td>900</td>
<td>90</td>
</tr>
<tr>
<td>8</td>
<td>700</td>
<td>70</td>
</tr>
</tbody>
</table>

PRACTICAL CAPACITY FOR ASPHALT COMPACTION

Practical capacity = 0.6 x theoretical capacity. The reduction factor of 0.6 assumes 25% overlap and an effective operating time of 50 minutes/hour. Working speed 6 km/h (100 m/minute).

Capacity in tons per hour

Normal values

<table>
<thead>
<tr>
<th>Number of vibrating passes</th>
<th>Practical surface cap. m²/h</th>
<th>Layer thickness after compaction cm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.5</td>
<td>3.5</td>
</tr>
<tr>
<td>2</td>
<td>2500</td>
<td>140</td>
</tr>
<tr>
<td>4</td>
<td>1250</td>
<td>75</td>
</tr>
<tr>
<td>6</td>
<td>830</td>
<td>50</td>
</tr>
<tr>
<td>8</td>
<td>620</td>
<td>35</td>
</tr>
</tbody>
</table>

As mentioned above, the capacity values given in the table represent practical average values. Variations may occur depending on how well the laying width corresponds to the width of the roller. The skill of the driver is also an influencing factor.

TECHNICAL DATA

GENERAL

Working weight (incl. driver + 50% water + 50% fuel) kg 6000
Net weight (without driver, fuel or water) kg 5500

Working weight per cm of drum width

Front drum with sprinkler water kg/cm 20.4
without sprinkler water kg/cm 19.3
Rear drum with sprinkler water kg/cm 22.5
without sprinkler water kg/cm 21.4

Drum width, front and rear drum mm 1400
Thickness of drum casing mm 16

Static linear load

Front drum, working weight kg 2850
net weight kg 2600
Rear drum, working weight kg 3150
net weight kg 2900

Centrifugal force, front and rear drums, see under "Centrifugal force at different amplitudes and frequencies".
Vibration frequency, front and rear drums
Amplitude, front and rear drums
Speed in both directions
Outer turning radius
Inner turning radius
Maximum gradient (without vibrations)
Maximum side inclination (without cab)
Water tank capacity
Towing distance
Towing speed

F4L 912 DEUTZ ENGINE
Number of cylinders
Displacement
Direction of rotation (viewed from flywheel)
Operating speed
Idling speed
Engine output at 2200 rev/min
Fuel
Fuel consumption
Fuel tank capacity

Lubricating oil. For API service CC/SE SAE, see table on page 18

Engine oil capacity
Crankcase oil capacity when changing the oil
Lubricating oil consumption
Net weight
Electrical system
Alternator
Battery
Air cleaner

PROPELLION SYSTEM
Variable axial piston pump
Overflow pressure (max.)
Suction filter
Hydraulic motors

VIBRATING AND STEERING SYSTEMS
Triplex pump (steering, vibrations)
Overflow pressure (max.)
Hydraulic motors (vibrations)
Steering valve
Overflow pressure (steering)
Short-duration pressure (steering)
Oil cooler
Suction strainer in vibration and steering circuit
Return filter in vibration and steering circuit

OIL CAPACITIES
Hydraulic oil tank
Drum

DIMENSIONS

Dimensions in mm

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>2300</td>
<td>1590</td>
<td>310</td>
<td>665</td>
<td>2700</td>
<td>4030</td>
<td>3075</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>1040</td>
<td>1400</td>
<td>1560</td>
<td>60</td>
</tr>
</tbody>
</table>

DRIVER'S PLATFORM

Fig. 3 Driver's platform

A. Forward-reverse lever
B. Vibration control, rear drum (black)
C. Vibration control, front drum (blue)
D. Parking brake
1. Socket for inspection lamp
2. Starter key
3. Charging indicator lamp
4. Oil pressure warning lamp
5. Sprinkler switch, rear drum
6. Sprinkler switch, front drum
7. Horn button
8. Rear headlights switch
9. Front headlights switch
10. Tachometer and operating hour meter
11. Engine speed control
12. Stop control
13. Brake warning lamp
FRAME

Made of heavy-duty sheet steel, the front and rear frame sections are joined to each other by means of an articulated steering hitch, consisting of two main parts - a horizontal and a vertical link.

The rear frame holds the hydraulic tank, and above it, the power unit is easily accessible for service.

A water tank is mounted on both front and rear frame halves. A fuel tank is also mounted on the front frame section.

DRUM AND VIBRATING SHAFT

The front and rear drums of the roller are identical and interchangeable, except that carrier D, Fig. 5 and drive motors B and C must be changed. The drum is made of heavy-duty sheet steel and attached to the frame by means of rubber shock absorbers.

Via the shock absorbers on one side, the drum is driven by a direct-coupled low-speed hydraulic motor. On the other side of the drum, the vibrating shaft is driven by a high-speed direct-coupled hydraulic motor.

The vibrating shaft is journalled in two self-aligning roller bearings and is completely separate from the frame bearings. Vibrations are generated by fixed and moving weights on the shaft. Weights A, Fig. 4 assume different positions in respect to each other depending on the direction in which the shaft rotates. Changing the direction of rotation, and consequently the amplitude, is performed from the driver's platform. At high amplitude, Fig. 4b, the weights work in union, but at low amplitude, the movable weights assume a position where they partially balance the fixed ones, Fig. 4a.

The drum is partially filled with oil which lubricates and cools the drum bearings. Filler opening and a level plug are provided in one of the drum head. When the drums rotate, the oil is carried up by the motion and runs down over the drum bearings.

Note: Do not engage the vibrations when the roller is stationary, as the drum bearings will then fail to be lubricated.

In order to keep the drum free from clinging materials, the roller is provided with adjustable scrapers, mats and water sprinklers (see under "Scrapers, sprinklers and mats").

viewed from vib motor side

Low amplitude

High amplitude

Fig. 4a CC 20 - 11178-1
Fig. 4b CC 20 - 11179-1

---

Fig. 5 Drum

A. Shock absorber  D. Carrier  G. Shaft  L. Vibrating motor
B. Drive motor,* front drum  E. Drum bearing  H. Level plug  M. Filler plug (drum oil)
C. Drive motor, rear drum  F. Eccentric weights  K. Main bearing

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* Note: The hubs of the hydraulic motors are marked "Loct 40". This means that the hub is secured with Loctite 40. Consult the workshop manual before assembling and dismantling the hydraulic motors.
MAINTENANCE

CHANGING OIL IN DRUM, Fig. 6a
Change the oil every year (or at intervals of 2,000 running hours).

1. Position the roller on a slight incline so that the level plug B, Fig. 6b, is at the lowest point on the roller as shown in Fig. 6a.
2. Remove plugs B and C, Fig. 6b.
3. Drain the oil.
4. Position the roller on a level surface.
5. Fill up with oil (see under "Checking the oil level in the drums").

Oil capacity: see under "Technical data".
Type of oil: see under "Lubricants".

CHECKING OIL LEVEL IN THE DRUMS, Fig. 6b
Check the oil level in the drums every week (or at intervals of 50 running hours).

Fig. 6b Checking the oil level, drum

1. Roll the machine along a level surface until the marks A on the inside of the drum casing are opposite the upper edge of the "frame."
2. Remove plug B.
3. If no oil runs out, top up via C until oil runs out through hole B.
4. Fit plugs B and C in place and tighten.

Note: The oil should be level with hole B.

CHECKING RUBBER SHOCK ABSORBERS AND RETAINING SCREWS
When the shock absorbers and retaining screws are new, they should be checked for the first time after 50 running hours and subsequently every six months (or at intervals of 1,000 running hours). Change shock absorbers if cracks of 15-20 mm deep appear.

DEUTZ DIESEL ENGINE
The engine is a four-cylinder, air-cooled diesel fitted with 24-volt electric starting equipment and an alternator with integral rectifier. This engine also has a separate oil cooler for cooling the hydraulic oil.

A Donaldson dry-type air cleaner is fitted to the engine.

MAINTENANCE

For further details of engine maintenance, apart from the instructions given here, refer to the Deutz Instruction manual.

FUEL
Fill up with diesel oil (Fig. 8) daily or at intervals of 10 running hours. Regular diesel oil from a well-known manufacturer should be used. The fuel requirements are given in the engine instruction manual.

Always observe the strictest cleanliness when filling up with fuel. Before filling up, check that cans, funnels and the like used for fuelling are scrupulously clean. Trouble-free operation of the injection pumps is very largely dependent on the fuel being free from impurities. Fill up the fuel tank in good time and do not allow it to run dry as the fuel system will then have to be bled. Instructions for bleeding the fuel system will be found in the engine instruction manual.

Cleaning the feed pump strainer, Fig. 7a
Every two weeks (or at intervals of 100 running hours) the strainer in the feed pump should be cleaned.

Remove the cover and packing.
Take out the strainer, wash it in diesel oil and reassemble the pump.
Check that no leakage occurs following reassembly.

Fig. 7a Feed pump

Changing the fuel filter, Fig. 7b
Every six months (or at intervals of 1,000 running hours) the engine fuel filter A (filter 2 in Fig. 9) should be changed.

1. Unscrew filter A carefully as fuel will run out of it.
2. Clean the sealing surface B on the filter housing.
3. Before fitting the new filter in place, lubricate the new rubber packing with fresh diesel fuel.
4. Screw the new filter in place by hand until the rubber packing is firmly seated and then tighten an additional half turn.
5. Bleed the fuel system as described in the Deutz instruction manual.

Check that no leakage occurs while the engine is running and also when it is started.

Fig. 7b Changing the fuel filter
Draining water from the fuel tank, Fig. 8
Every six months (or at intervals of 1,000 running hours) any water in the fuel tank 1 should be drained.

Fig. 8 Draining the fuel
1. Fuel tank 3. Fuel dock 5. Fuel return line
2. Fuel filler cap 4. Drain plug
1. Remove the fuel tank filler cap and drain plug 4 located under the fuel tank.
2. Drain off the water.
3. Screw the drain plug and filler cap back in place.

LUBRICATING OIL
The choice of lubricating oil is extremely important and the engine manufacturer specifies that only oil "For API service CC/SE SAE" (see table below or on page 18) may be used. Apart from its excellent lubricating properties, this oil also has the ability to keep combustion products suspended in the oil in finely dispersed form and to inhibit the formation of carbon. As a result, the oil soon turns dark in colour but its lubricating properties are not affected by this.

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Viscosity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above +20°C</td>
<td>SAE 30</td>
</tr>
<tr>
<td>+20°C to -10°C</td>
<td>SAE 20 W/20</td>
</tr>
<tr>
<td>Below -10°C</td>
<td>SAE 10 W</td>
</tr>
</tbody>
</table>

Checking the oil level in the injection pump, Fig. 9
Check the oil level every two weeks (or at intervals of 100 running hours).
1. Back off level plug 6, three turns, allowing any surplus fuel-oil mixture to run out.
2. If necessary, unscrew filler plug 7 and replenish with fresh oil up to the level plug.
3. Screw the level plug and filler plug back in place.

Checking the engine oil level, Fig. 9
Check the oil level daily (or at intervals of 10 running hours).
1. The roller should be on level ground and switched off for at least 15 min. before checking the oil level.
2. Withdraw the dipstick 3 which is accessible on removal of the engine inspection cover on the left-hand side of the roller.
3. Wipe the dipstick with a clean rag.
4. Insert the dipstick all the way into the engine and then withdraw it. The oil should be level with the upper mark A on the dipstick.

5. If the oil in the engine has fallen below the lower mark B it should be immediately topped up to avoid serious damage to the engine (seizing of pistons and bearings).

Fig. 9 Deutz engine
1. Oil filter 6. Level plug (injection pump)
4. Hydraulic oil filler cap A. Upper oil level mark
5. Oil filler cap B. Lower oil level mark

Changing the engine oil, Fig. 9
Every two weeks (or at intervals of 100 running hours) the engine oil should be changed. Stop the engine and change the oil while it is still hot.
1. Remove oil filler cap 5, which is accessible on removal of the engine inspection cover on the left-hand side of the roller.
2. Remove the plug on the "pipe extending under the engine" which is connected to the oil sump.
3. Drain the oil.
4. Screw the plug back in place.
5. Fill up with fresh oil.
6. Screw oil filler cap 5 back in place.
7. Check the oil level (see under "checking the engine oil level").

Note: If the engine is new or reconditioned, change the oil after 20, 60 and 100 running hours. Use a grade of oil corresponding to the requirements specified in the Deutz Instruction Manual.

Oil capacity: See under "Technical data".
Type of oil: See under "Lubricants".

Changing the engine oil filter, Fig. 10
Every two weeks (or at intervals of 100 running hours) and in conjunction with changing the engine oil, the engine oil filter A should also be changed.
1. Slacken oil filter A, using a drift or screwdriver (slots at the bottom of the filter).
2. Then unscrew the filter by hand.
3. Clean the seating surface of the filter holder.
4. Lightly oil the rubber packing B before fitting the new filter.
5. Screw the new filter in place by hand until the rubber packing is firmly seated and then tighten an additional half a turn.

Check that no oil leakage occurs at the oil filter while the engine is running and when it is started.

Note: If the engine is new or reconditioned the oil filter should be changed after 20 running hours.

AIR CLEANER

The dry-type air cleaner operates on the two-stage principle. In the first stage the particles of dirt are caused to rotate inside the filter whereby they are separated out by centrifugal force down to the base of the filter.

The second stage consists of a fine-filter element made of specially impregnated paper which can be cleaned several times.

Cleaning the air cleaner

Every week (or at intervals of 50 running hours) the air cleaner should be cleaned - if operating under extremely dusty conditions it should be cleaned daily. Under no circumstances should the layer of dust in the base of the filter be allowed to rise higher than 1 cm from the base insert.

Proceed as follows when emptying the base, Fig. 11

1. Slacken the wing nut 2 and remove the base.
2. Slacken wing nut 5 holding the base insert and remove the insert.
3. Check that no parts of the filter insert such as loose plastic vanes or the like are in the dirt in the filter base. If they are, a replacement filter insert must be fitted immediately.
4. Empty and clean the filter base carefully.

Cleaning by blowing with compressed air, Fig. 12

Air pressure should not exceed 0.59 MPa (5 atg). Blow the air through the element in the opposite direction to the air flow, i.e. from the inside and outwards. Hold the air nozzle at some distance from the insert. When dirt particles are not longer visible on the folded paper, the filter is clean. A filter insert that has been soaked by oil or the like must be cleaned by washing.

Cleaning by washing, Fig. 13

Wash the filter insert in a solution of water and Donaldson D-1400 detergent.

Washing time: approximately 15 minutes. Raise and lower the filter in the solution while washing it.

Then rinse the filter in clean water and dry it (max. +80°C). To check that the filter insert is undamaged (no cracks in the filter paper, etc.) illuminate the filter from inside by means of a 200 W bulb after drying.

If any defects are found in the filter insert, it must be replaced by a new one. This is mandatory.

After having been washed approximately six times, or after one year, the filter insert should be discarded.

CHECKING THE ENGINE V-BELTS

Checking alternator V-belt tension, Fig. 14

Every two weeks (or at intervals of 100 running hours) check that V-belt A is correctly tensioned.

To check the belt tension, press the belt down with a force of approximately 59 N (6 kgf) midway between the alternator and diesel engine pulleys. It should not be possible to depress the belt by more than 10-15 mm. If it can be depressed further than this, the belt should be tensioned.
Tensioning alternator V-belt, Fig. 15
1. Back off one of the alternator retaining screws B, C and nut D.

2. Then press the alternator outwards until its V-belt is again correctly tensioned.

3. Then tighten nut D and screws B, C.

Note: A new alternator belt should be tensioned for the first time not later than after 50 running hours.

Fig. 15 Tensioning the belt

Changing alternator V-belt, Fig. 15
1. Slacken the alternator retaining screws B, C and nut D.

2. Then press the alternator inwards towards the engine. The belt can then be removed or fitted without difficulty.

3. Tension the V-belt as described above.

Note: To avoid damage, V-belts should not be removed or fitted with force (by using a screwdriver or the like).

Checking cooling fan V-belt, Fig. 16
The V-belt is kept tensioned by means of a spring-loaded belt tensioner F. If the belt should break or run off the pulleys, the belt tensioner will spring out and actuate the mechanical stop control so that the engine will stop.

When changing V-belt E, the spring-loaded belt tensioner S should be pressed firmly inwards, permitting the V-belt to be fitted.

Fig. 16 Checking the V-belt

CHECKING VALVE CLEARANCES
If the engine is new or reconditioned, valve clearances should be checked in conjunction with the first and second oil changes (after 20 and 40 running hours respectively). Following this, valve clearances should be checked every month (or at intervals of 200 running hours). Valve clearances should be checked when the engine is cold. Correct valve clearance is 0.15 mm. For adjustment, see engine instruction manual.

ENGINE COOLING FINS
Every two weeks (or at intervals of 100 running hours) the engine cooling fins should be cleaned. See engine instruction manual.
HYDRAULIC SYSTEM
SCHEMATIC ARRANGEMENT OF HYDRAULIC SYSTEM, Fig. 17

Fig. 17 Schematic arrangement of hydraulic system

A. Drive motor
B. Manifold with valve assy.
C. Pressure relief valve
D. Variable displacement pump (drive pump)
E. Steering cylinder
F. Relief valves
G. Steering valve
H. Triplex fixed displacement pump (steering)
I. Control valve with overload valve
J. Vibration motor
K. Oil cooler
L. Oil return filter
M. Oil return filter
N. Suction strainer
O. Suction filter
P. Relief valve (charge pressure)
Q. Check valve
R. Overload valve
S. Two-way shuttle valve
T. Relief valve (charge pressure)
U. Overload valve
V. Overload valve

CC 20 - 11437-1
Fig. 18 Propulsion system showing the flow of oil when the roller is moving forward

1. Forward and reverse control
2. Variable displacement pump (drive pump)
3. Connecting block
4. Temperature stabilizing return line and oil leakage line
5. Pressure line (main circuit)
6. Return line (main circuit)
7. Hydraulic drive motor
8. Scavenging oil line
9. Hydraulic oil tank
10. Relief valve (charge pressure)
11. Suction filter
12. Suction line
13. Leakage oil line (return from vibration system)
14. Servo control valve
15. Manifold with valve assy.

PROPULSION HYDRAULICS, Fig. 18

The propulsion hydraulic system consists of a suction filter 11, a pump unit 2, two low-speed hydraulic motors 7 and a connecting block 3.

The pump unit contains primarily a variable displacement pump (an adjustable axial piston pump), a charge pump (gear-type pump) 16, a manifold 14 with valve assy and a servo control valve 14.

The variable displacement pump, charge pump and control valve have different functions in the system and the variable displacement pump with its main circuit and the charge pump with its feed circuit are described below. See the workshop manual for a more detailed description of the propulsion system.

Main circuit, Fig. 17

In the closed main circuit, the oil circulates between the pump and the motors. The volume of oil circulating is dependent on the angle of the variable displacement pump swashplate. This determines the speed of the motors. The positive or negative angle of the swashplate determines the direction of flow and consequently the direction of rotation of the motors. Built into the manifold on the pump are the overload valves 5 which determine the max. pressure.

Charge pump circuit, Fig. 17

The function of the charge pump is to compensate the losses of leakage oil in the main circuit and maintain a certain minimum pressure in the main circuit. In addition, it has to supply the control valve with oil and continuously replace part of the hot oil in the main circuit with cold, filtered oil. When the swashplate is in the neutral position, the charge pump discharges the surplus oil via pressure relief valve Q.
When the roller is in motion, the charge pump supplies oil via check valve R for the charge circuit to the return side of the main circuit.

Due to this supply of charge oil, the main pump cannot accept all return oil from the motors. The return oil displaced by the charge oil flows via two-way shuttle valve T and pressure relief valve U to the pump housing. When this oil has circulated the pump housing, it is distributed in parallel to the motors for circulation in the motor housings.

AT BREAKDOWN
If a breakdown should occur in any of the components of the system, particles resulting from the damage will circulate with the oil. To prevent further damage from occurring, the oil in the entire system should therefore be changed and all components thoroughly cleaned with the aid of a high-pressure, full-flow filters.

MAINTENANCE
The hydraulic unit and drive motors are lubricated by the hydraulic oil and no additional lubrication is necessary nor provided for.

Changing the suction filter in the propulsion system, Fig. 19
When the machine is new, the filter should be changed after 100 running hours and subsequently every six months (or at intervals of 1000 running hours). When operating under dusty conditions, it should be changed twice as often or every 500 running hours.

When components of the system are reconditioned or replaced, the filter should be changed at 10, 50 and 100 running hours and subsequently every six months (or at intervals of every 1000 running hours). When operating under dusty conditions, it should be changed every three months or at intervals of 500 running hours. The filter A (ref. 11 in fig. 18) is mounted on the hydraulic oil tank on the left-hand side of the roller under the inspection cover.

1. Pierce a hole in the top of the filter cartridge, using a screwdriver.
2. Unscrew filter A.
3. Clean the sealing surface on the hydraulic oil tank.
4. Lightly oil the rubber packing on the new filter.
5. Screw the filter in place by hand until the rubber packing is located firmly in place, and then tighten, using the special strap provided with the roller. 1 to 1 1/2 turns is normally sufficient.
6. Check for leakage after starting.

Fig. 19 Suction and return filter
A. Suction filter (propulsion circuit)
B. Filter hole, hydraulic oil
C. Return filter (steering and vibration circuit)

Fig. 20 Steering system showing the sequence of operation when the roller is turning to the right
1. Operating valve
2. Pressure line (steering)
3. Pressure line (vibrations)
4. Triplex pump
5. Suction line
6. Hydraulic oil tank
7. Suction strainer
8. Return line from steering cylinder
9. Pressure line to steering cylinder
10. Steering cylinder (right-hand)
11. Grease nipple
12. Return line from operating valve
13. Return line from steering cylinder
14. Pressure line to steering cylinder
15. Return filter
16. Return line from filter
17. Steering cylinder (left-hand)
18. Return line from oil cooler (vibration system)

STEERING HYDRAULICS, Fig. 20
Steering hydraulics consists of a suction strainer 7, a triplex pump 4, a steering valve 1, two steering cylinders 10 and 17, and a return filter 15. The steering valve is described below.

The pump is described under "Vibration system". For a more detailed description of the steering system, see the workshop manual.

Steering valve
The valve consists of a metering pump and a servo valve.

The metering pump contains a gear set which supplies a definite volume of oil proportionate to the movement of the steering wheel.
The operating valve has a large capacity in relation to its size.
The servo valve directs the oil via the metering pump in the correct direction to the steering cylinders and cuts off the supply of oil when the volume of oil corresponding to the movement of the steering wheel has passed through. This is the reason why no mechanical connection between the steering wheel and the drum is necessary.

A valve unit with double relief valves F, Fig. 17, and overload valve V is mounted on the operating valve.

**AT BREAKDOWN**

If a breakdown should occur in any of the components of system, any particles resulting from the damage will circulate with the oil.

To prevent further damage from occurring, the oil in the entire system should therefore be changed and all components thoroughly cleaned with the aid of a high-pressure full flow filters.

**MAINTENANCE**

The triplex pump and steering cylinders are lubricated by the hydraulic oil and no additional lubrication is necessary or provided for.

**VIBRATION SYSTEM**

![Vibration system diagram]

Fig. 22 Vibration system, showing the sequence of operation when high amplitude is engaged

1. Vibration control
2. Pressure line (main circuit)
3. Vibration motor
4. Leakage oil line
5. Return line (main circuit)
6. Hydraulic oil tank
7. Suction strainer
8. Return line from control valve
9. Suction line
10. Return line from filter
11. Triplex fixed displacement pump
12. Pressure line (rear vibration motor)
13. Pressure line (front vibration motor)
14. Pressure line to steering valve
15. Return line from steering valve
16. Cooler
17. Pressure line to cooler
18. Return line from cooler
19. Return filter
20. Control valve (front vibration motor)
21. Control valve (rear vibration motor)
22. Connecting block
23. Temperature stabilizing return line and oil leakage line (rear drive motor)

**Lubrication of the steering cylinder retaining bolts**, Fig. 21

Every week (or at intervals of 50 running hours) the steering cylinder retaining bolts should be lubricated. Clean the four grease nipples A. Five strokes of the grease gun are required for satisfactory lubrication.

Type of grease: see under "Lubricants".

**Lubrication of the steering hitch**, Fig. 21

Every week (or at intervals of 50 running hours) the steering pivot should be lubricated. Clean the two grease nipples B (one nipple not shown). Five strokes of the grease gun are required for satisfactory lubrication.

Type of grease: see under "Lubricants".

Fig. 21 Lubrication of steering hitch and retaining bolts
VIBRATION HYDRAULICS

The vibration hydraulic system consists of a suction strainer 7, a triplex pump 11, control valves 20 and 21, two high-speed gear motors 3, an oil cooler 16 and a return filter 19. For a more detailed description of the vibration system, see the workshop manual.

Triplex fixed displacement pump, Fig. 22

The triplex pump is a reliable high-pressure pump consisting mainly of gears, bearing brackets with plain bearings and roller bearings, shaft seals, pressurizing valves and pressure plates. Oil leaking via gaps and shaft seals is carried via the pressurizing valve to the suction side. A pressure of 49 kPa (0.5 atm) in the pressurizing valve ensures that oil is always supplied to all bearings and so prolongs their working life.

Oil pressure equalizes the axial and radial clearances between the gears and the housing. This ensures high volumetric efficiency. Holes in the pressure plate lead the high pressure oil radially round the gears so that minimum stresses are imposed on the bearings. The number of teeth on the gears is adapted to the module so that pulsation is insignificant and the noise level lower.

AT BREAKDOWN

If a breakdown should occur in any of the components of the system, any particles resulting from the damage will circulate with the oil. To prevent further damage from occurring, the oil in the entire system should therefore be changed and all components thoroughly cleaned with the aid of a high-pressure, full-flow filters.

MAINTENANCE

The triplex pump and the vibration motors are lubricated by the hydraulic oil and no other lubrication is necessary nor provided for.

Cleaning the suction strainer in the hydraulic oil tank (steering and vibration circuit), Fig. 23

Every year (or at intervals of 2000 running hours) strainer B (7 in Fig. 22) in the hydraulic oil tank should be cleaned in conjunction with changing the oil (see under "Changing the hydraulic oil"). The strainer is located in the suction line to the triplex pump in the integral hydraulic oil tank.

The strainer is mounted in the hydraulic oil tank on the left-hand side of the roller under the battery frame.

1. Remove the batteries.
2. Dismantle the battery frame.
3. Wipe all surrounding surfaces and cover C clean.
4. Disconnect the suction line E at cover C.
5. Then back off the cover retaining screws.
6. Lift up cover C holding the strainer D.
7. Wash the strainer in diesel oil and blow it dry.
8. Fit in the reverse order.
9. Bleed the system (see under "Bleeding the hydraulic system").

Changing the hydraulic oil, Fig. 23

Every year (or at intervals of 2000 running hours) the hydraulic oil should be changed.

1. Back off filter plug B, Fig. 19 and drain plug A located in the bottom cover of the hydraulic tank.
2. Drain the oil. If necessary, clean the tank with diesel oil or the like through cover C where the strainer is located.
3. Screw the drain plug back in place.
4. Then fill up with fresh oil and fit the filler plug in position.
5. Check the oil level (See under "Checking the hydraulic oil level").
6. Bleed the system (see under "Bleeding the hydraulic system").

Oil capacity: see under "Technical data"
Type of oil: see under "Lubricants"

Checking the hydraulic oil level

Every day (or at intervals of 10 running hours) the level of the hydraulic oil should be checked.

The sight glass is located on the left-hand side of the roller, on the hydraulic tank. Check the level when the roller is standing on a level surface. The oil level should remain at about the middle of the sight glass.

Also check that the air hole in the filler plug for the hydraulic oil is not clogged.

Bleeding the hydraulic system

The hydraulic system should be bled from air after changing the oil.

1. Fill up with oil to the upper mark on the sight glass.
2. Set the forward and reverse lever A and the vibration controls B and C, Fig. 30 in the neutral position.
3. Start the diesel engine and warm it up at approximately 600 rev/min for 3 minutes if the oil temperature is 20°C or above. Warm the engine up for about ten minutes if the oil temperature is below 20°C.

4. Check the level of the hydraulic oil in the tank. Top up if necessary.

5. Increase the engine speed to 1200-1500 rev/min and run the machine forwards and in reverse for about five minutes.

6. Check the level of the hydraulic oil in the tank at regular intervals. Top up if necessary.

7. Turn the steering wheel slowly to the right and to the left at full lock a few times until the steering system functions faultlessly.

8. Engage the vibrations while the roller is in motion.

9. Check the hydraulic oil level.

10. Check the oil level after the roller has been in operation for about one hour.

Checking the triplex pump V-belt tension, Fig. 24
Every two weeks (or at intervals of 100 running hours) check that the V-belts D are correctly tensioned. To check the belt tension, press the belts down with a force of approx. 59 N (6 kgf) midway between the triplex pump and diesel engine pulleys. It should not be possible to depress the belts more than 10 mm. If they can be depressed further than this, the belts should be tensioned.

![Diagram of triplex pump V-belt tension](image)

**Fig. 24 Checking and changing the V-belts (triplex pump)**

- Retaining screw A
- Triplex pump B
- Lock nut C
- Tensioning screw D
- V-belts E

**Tensioning the triplex pump V-belts, Fig. 24**

1. Back off the three triplex pump retaining screws A.
2. Back off lock nut E. Turn the tensioning screw B clockwise. This alters the position of the triplex pump and the belts can then be removed or fitted without difficulty.
3. Tension the V-belts as described in the section above.

**Note:** Both belts must be changed at the same time.

**SCRAPERS, SPRINKLERS AND MATS**

**SCRAPERS, Fig. 25**

Both drums are equipped with two adjustable, spring-loaded scrapers to prevent clinging materials from adhering to the drum.

Adjust the clearance as follows:

1. Back off the retaining screws A.
2. Adjust the scrapers until they are approximately 10 mm from the drum.
3. Tighten the retaining screws.

**Note:** Under no circumstances should the scrapers be in contact with the drums, due to the wear and irritating noise which this causes.

![Diagram of scraper](image)

**Fig. 25 Scrapers**

**SPRINKLERS AND MATS**

For work on asphalt, the roller is fitted with sprinklers and mats on both drums, the purpose of the mats being to remove small particles sticking to the drum.

In front of each mat is a sprinkler pipe E, Fig. 26 of stainless steel which distributes the water uniformly over the whole width of the drum. These pipes can easily be cleaned after removal of the end plugs B.

The water tanks are located in the front and rear parts of the frame. Water flow is regulated by means of solenoid valve A which is operated from the driver’s platform by means of toggle switches 5 and 6, Fig. 30. These switches have a neutral centre position. When moved forward, water runs out as long as they are held in this position. This provides scope for metering the amount of water running onto the drums.

When the switches are moved rearward they remain in this position and water runs out continuously.

**CLEANING THE WATER TANK STRAINER**

Located inside the water tank is a strainer C, Fig. 26 which prevents dirt and sludge from clogging the sprinkler pipe.

1. Using a screwdriver, remove the solenoid valve by prising off the plastic washer holding solenoid valve A.
2. Back off retaining screw B.
3. Strainer C is located under the cover and can then be removed for cleaning.
4. Assemble in reverse order.

![Fig. 26 Water tank](image)

A. Solenoid valve  C. Strainer  E. Sprinkler
B. Retaining screws  D. End plugs  pipe

PARKING BRAKE

The roller is equipped with a mechanical parking brake D (Fig. 30) operated from the driver's platform. It acts on the rear drum.

Note: If the roller is parked on an incline, place a chock, stone or the like in front of the drums as an extra safety measure.

When the diesel engine is running, the hydraulic drive motor acts as an effective brake when the forward and reverse lever is in the neutral position. When the diesel engine is switched off, the hydraulic drive motor cannot be used as a parking brake, because its braking ability gradually diminishes. The reason for this is that the pressure in the hydraulic motor will gradually fall due to internal leakage, and its braking ability is accordingly reduced.

Note: Never leave the roller unattended without applying the parking brake.

Replacement of the brake linings and cable and adjustment of the cable are described in the Workshop Manual.

CHECKING AND ADJUSTING THE PARKING BRAKE

Check the parking brake every day (or at intervals of 10 running hours). It should be checked on a hill with a 15% gradient.

If adjustment is necessary, proceed as follows:

![Fig. 27a Brake not applied](image)

1. Lower the brake lever to the horizontal position as shown in Fig. 27a.

2. Turn the adjusting sleeve at the upper end of the lever clockwise.
3. Following this, pull up the brake lever to see if it will assume the vertical position as shown in Fig. 27b. (When correctly adjusted it should offer some resistance when moved to the vertical position.)
4. Adjustment of the brake shoes is by means of adjusting screw 1, Fig. 27c at the rear of the brake backplate.

![Fig. 27c Brake backplate](image)

1. Adjusting screw

![Fig. 28 Tachometer and running hour meter](image)

TACHOMETER

The roller is equipped with a mechanical tachometer incorporating a running hour meter A, Fig. 28.

LUBRICATING THE TACHOMETER CABLE

Every six months (or at intervals of 1,000 running hours) the tachometer cable should be lubricated with Molykote.

1. Disconnect the cable at the tachometer.
2. Lubricate the tachometer cable by introducing a few drops of Molykote M55 into the cable sheathing.
3. Connect the cable to the tachometer.

CALCULATING RUNNING HOURS

In order to obtain an accurate estimate of running time, the indicated number of running hours should be multiplied by a factor shown in the table below.

<table>
<thead>
<tr>
<th>Engine rpm</th>
<th>Factor</th>
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<tbody>
<tr>
<td>2000</td>
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<tr>
<td>2150</td>
<td>0.70</td>
</tr>
<tr>
<td>2200</td>
<td>0.68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Example: Indicated running hours</th>
<th>Factor for 2,000 rpm</th>
<th>Actual running hours</th>
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</thead>
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<tr>
<td>14.7</td>
<td>0.68</td>
<td>10</td>
</tr>
<tr>
<td>73.5</td>
<td>0.68</td>
<td>50</td>
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</tbody>
</table>

ELECTRICAL SYSTEM

BATTERIES

The roller is equipped with two 12 volt starting batteries of 98 Ah capacity. Keep the batteries dry and clean. At regular intervals clean the terminals and smear them with petroleum jelly or the like.
BATTERY CHARGING AND CHECKING THE ELECTROLYTE
A fully charged battery delivers 12 V and the specific gravity of the electrolyte at 80°C should be 1.28 g/cm³ (at lower temperatures the specific gravity is somewhat higher).

The level of the electrolyte in the battery should be approximately 10 mm above the perforated plates. If the electrolyte level should fall, distilled water must be added (never acid). When the battery is connected to a charger, the charging current should not be allowed to exceed 8 A. Unscrew the filler plugs while charging is in progress so that the gas formed can escape. A naked flame should never be used in the vicinity of the battery as this gas is explosive. If unused for a lengthy period of time, the battery should be charged every 4th to 6th week.

ALTERNATOR
The engine is equipped with an alternator. The following should be observed:

1. Check that the battery is connected with the right polarity. Incorrect battery connection will quickly ruin the alternator rectifier.
2. The charging circuit should not be interrupted when the engine is running. If this circuit is broken at any point while the alternator is charging, damage to the alternator rectifier may be caused. In cases where a transistorized voltage regulator is used, this may also be damaged.
3. Boost charging
   Connect positive to positive and negative to negative. Reversed polarity will quickly ruin the rectifier.
4. Adopt the following measures when performing electric welding on the roller:
   A. First disconnect the battery earth lead.
   B. Disconnect the lead to B+ on the alternator (in systems with positive earth, the lead to B-).
   C. Pull the plug out of the charging relay.

WIRING DIAGRAM

![Wiring Diagram](Fig. 29)

CABLE COLOUR CODE

<table>
<thead>
<tr>
<th>b</th>
<th>gr</th>
<th>br</th>
<th>g</th>
</tr>
</thead>
<tbody>
<tr>
<td>black</td>
<td>green</td>
<td>brown</td>
<td>grey</td>
</tr>
</tbody>
</table>

38. Solenoid valve, rear
39. Sprinkler switch, rear
40. Horn button
41. Horn
42. Sprinkler switch, front
43. Inspection lamp socket
44. Solenoid valve, front
45. Warning lamp, oil pressure
46. Indicator lamp, charging
47. Fuse box
48. Headlamp dip switch
49. Starter switch
50. Switch
51. Oil pressure sender unit
52. Battery
53. Relay
54. Alternator
55. Starter
56. Rear light
57. Headlamps, rear
58. Brake contact
59. Brake warning lamp
60. Headlamps, front
OPERATING INSTRUCTIONS

STARTING AND STOPPING

Fig. 30 Driver’s platform

A. Forward and reverse lever
B. Vibrations (rear drum)
C. Vibrations (front drum)
D. Parking brake
E. Horn button
F. Front headlamps
G. Ignition key
H. Rear headlamps
I. Oil pressure warning lamp
J. Sprinkler switch (front drum)
K. Sprinkler switch (rear drum)
L. Brake warning lamp
M. Throttle
N. Tachometer

BEFORE STARTING, Fig. 30
1. Fill the fuel tank.
2. Open the fuel cock 3, Fig. 8.
3. Check the engine oil level. It should reach up to the upper mark on the dipstick.
4. Check the oil level in the hydraulic oil tank. It should be approximately in the centre of the sight glass.
5. Check the parking brake D, Fig. 30 and adjust if necessary.
6. Make sure the water tanks are full (when working on asphalt).
7. Set the forward and reverse control A in the neutral position.
8. Set the vibration controls B and C in the neutral position.
9. Check that the stop control 12 is depressed.

STARTING, Fig. 30
1. Make sure that the knob for locking the throttle 11 marked “Release-hold” is not applied.
2. Depress the button in the centre of the throttle and (holding the button depressed) pull the throttle about a quarter out.
3. Insert the ignition key 2, turn it to the right (clockwise) to the click position. This should cause the charging indicator lamp 3 and low pressure warning lamp 4 to light up.
4. Press in the ignition key and turn it to the right (clockwise) against spring pressure until the starter engages. Release the ignition key as soon as the engine fires. The spring pressure should then cause the key to return to the first click position.

Never keep the starter engaged for longer than five seconds at a time. Spare the battery by waiting a minute before attempting to start again.

STARTING IN WINTER
1. Keep the batteries fully charged. Fully-charged batteries deliver sufficient current to overcome the higher starting resistance of the engine at low temperatures. They will also be less likely to freeze.
2. Keep the batteries in heated premises at night in exceptionally cold weather.

AFTER STARTING, Fig. 30
1. Check that the oil pressure warning lamp 4 and charging indicator lamp 3 have gone out. If the oil pressure warning lamp remains alight, stop the engine immediately and establish the cause of the fault with the aid of the fault-tracing schedule in the engine instruction manual.
2. Warm up the engine for a few minutes at idling speed (550-650 rev/min). In winter, warm it up for about 10 minutes at idling speed.
3. Increase the engine speed 2200 rev/min. Fine adjustment of engine speed can be made by turning the adjusting screw on the throttle.

STOPPING, Fig. 30
1. Reduce the engine speed to idling.
2. Allow the engine to run for a few minutes at idling speed.
3. Stop the engine by pulling out the stop control 12.
4. Turn the ignition key to the left and withdraw it, causing the charging indicator lamp and oil pressure warning lamp to go out.

DRIVING, Fig. 30
1. Release handbrake D.
2. Set the roller in motion by moving the forward and reverse lever A in the required direction of travel. Change the direction of travel by moving the lever smoothly to the opposite position.

BRAKING
All normal braking should be carried out with the forward-reverse levers A, Fig. 30. If the hydraulic system is out of order, use the parking brake.

PARKING
Pull up parking brake lever D, Fig. 30.

Note: If the roller is parked on an incline, place a chock, stone or the like in front of the drums as an extra safety measure.
1. Select the amplitude by setting the vibration controls B and C to low or high amplitude.

Note: When changing the amplitude, the direction of rotation of the vibration motor is changed. Make absolutely sure that the vibration motor has stopped before changing amplitude. The time required to move the "plates" through 180° is usually sufficient to allow the vibration motor to come to rest.

2. Engage the vibrations (rear vibrations black knob, front vibrations blue knob). Disconnect the vibrations when changing direction of travel on asphalt or soft ground.

Note: If the engine speed should drop below 2200 rev/min when changing amplitude, it should be readjusted to the correct speed.

3. Disconnect the vibrations before stopping the engine.

TOWING

The roller may be towed if the engine is stopped and the forward and reverse lever moved to the neutral position. Towing should always be carried out with the greatest caution. The towed distance must not exceed 500 metres. The towing speed must not exceed 1 km per hour.

LIFTING THE ROLLER

Before the roller is lifted, the front and rear parts of the frame must be latched to each other on both sides by means of chains. This is a safety measure to avoid damage to any of the steering hoses when the roller is lifted.

The machine is then lifted in the elongated holes located in the sides of the roller frames.

Total weight of machine: see under "Technical data".

Note: Do not walk under a hanging load.

MAINTENANCE

GENERAL LUBRICATING RULES

1. Always use good-quality lubricants. This will prolong the machine life and will reduce the repair costs.

2. Always clean round the lubricating points before lubricating.

3. Always use the prescribed amount of lubricant. Excessive grease or oil may cause the parts concerned to run hot, with rapid wear and breakdown as a result.

4. Oil should be changed while the old oil is still hot.

LUBRICANTS

<table>
<thead>
<tr>
<th>Type</th>
<th>Ref.</th>
<th>Grade</th>
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</thead>
<tbody>
<tr>
<td>Grease</td>
<td>A</td>
<td>Shell Alvania EP Grease 2 or an equivalent lithium-base grease with an EP additive (lead soap) and NLGI value = 2</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>Molyctype type M 55</td>
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<tr>
<td></td>
<td></td>
<td>Application: air temperature -27°C — +20°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shell Tellus T Oil 27</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or other high-grade hydraulic oil with an anti-wear additive &gt;50°C</td>
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<tr>
<td></td>
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<td>or other high-grade hydraulic oil with an anti-wear additive &gt;50°C</td>
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<td>Motor oil **</td>
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<td>Application: air temperature -10°C — +20°C</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>or other high-grade hydraulic oil with an anti-wear additive &gt;50°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26 cSt.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application: air temperature 0°C — +50°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shell Tellus T Oil 72</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or other high-grade hydraulic oil with an anti-wear additive &gt;50°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>76 cSt.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Application: air temperature -18°C — +40°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Shell Tellus T Oil 33</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or other high-grade hydraulic oil with an anti-wear additive &gt;50°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38 cSt.</td>
</tr>
</tbody>
</table>

* Machines with Serial No. 489 533 — delivered ex-works with Shell Tellus T Oil 27. This oil can be mixed with other recommended oils.

** Machines with Serial No. 489 533 — supplied ex-works with Shell Rotella TX Oil 10W/30. This oil may be mixed with other recommended oils.
MAINTENANCE SCHEDULE

Engine maintenance (oil change intervals, etc.), in addition to the operations outlined here, shall conform with the requirements indicated in the manufacturer's Instruction Manual.

If the engine is new or reconditioned, the engine oil and oil filter should be changed after 20 running hours. The engine oil should be changed again after 60 running hours. Subsequently, the engine oil and oil filter should be changed in accordance with the maintenance schedule.

If the Sundstrand pump is new or reconditioned, the hydraulic oil filter in the suction line should be changed at 10, 50, 100 and, under especially severe operating conditions, also at 500 running hours. Subsequently, the filter should be changed in accordance with the maintenance schedule.

Fig. 32 Maintenance schedule ref. numbers

Note: Only periodic maintenance intervals are indicated in the maintenance schedule. Additional instructions will be found in the instruction manual and must be followed when the machine is new or when components have been reconditioned or replaced.

<table>
<thead>
<tr>
<th>Interval</th>
<th>Ref. No. in Fig. 32</th>
<th>Maintenance operation</th>
<th>See page</th>
<th>Lubricant Ref., see page 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily or at intervals of 10 running hours</td>
<td>4</td>
<td>Check engine oil level</td>
<td>7</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Check parking brake</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Fill up with diesel oil</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Check hydraulic oil level</td>
<td>14</td>
<td>C</td>
</tr>
<tr>
<td>Every week or at intervals of 50 running hours</td>
<td>2</td>
<td>Clean air filter</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Check oil level in drums</td>
<td>6</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Lubricate steering pivot</td>
<td>13</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Lubricate steering cylinder retaining bolts</td>
<td>13</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Check electrolyte level in batteries</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Every 2 weeks or at intervals of 100 running hours</td>
<td>1</td>
<td>Check the tension of fan and alternator belts</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Change engine oil filter</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Change engine oil</td>
<td>7</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Check hydraulic pump belt tension</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Clean the fuel strainer in the engine feed pump</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>Check the oil level in the injection pump</td>
<td>7</td>
<td>D</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>Clean the engine cooling fins (see Eng. Instr. Manual)</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Every month or at intervals of 200 running hours</td>
<td>25</td>
<td>Check engine valve clearances</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Every 6 months or at intervals of 1000 running hours</td>
<td>6</td>
<td>Change engine fuel filter</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Check rubber-metal blocks and retaining bolts</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Change filter in return line (vibr. and steering circuit)</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Drain off any water in fuel tank</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Change filter in suction line (power train circuit)</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>Lubricate the tachometer cable</td>
<td>16</td>
<td>B</td>
</tr>
<tr>
<td>Every year or at intervals of 2000 running hours</td>
<td>2</td>
<td>Change the filter element in the air cleaner</td>
<td>8</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Change oil in drums</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Change hydraulic oil</td>
<td>14</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Clean strainer in hydraulic oil tank</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>
CALLING FOR A SERVICE MECHANIC

Call any of our service depots if the services of a mechanic are needed. Provide as detailed information as possible to the contact man at the depot. If the mechanic has a clear idea of the work entailed before leaving the service depot, he will be better prepared for the job and will also have the correct spare parts when he arrives at the work site.

ORDERING SPARE PARTS

Spare parts can be ordered by using the enclosed spare parts catalogue. Be sure to follow the instructions provided in the catalogue for ordering spare parts. Correct details will ensure prompt delivery.

ROLLER DISTRIBUTOR AND SERVICE CENTER

Specifications subject to alteration without prior notice.